

THE
AGRICULTURAL LEDGER.

1898—No. 14.

—
COAL.

(INDIAN COAL.)

(DICTIONARY OF ECONOMIC PRODUCTS, Vol. II., C. 1414-41.)

—
REPORT ON THE COAL SUPPLY OF INDIA.

Including results of the Examination of Selected Samples from the Principal
Seams. (With Appendix containing Tables of Results.) By PROFESSOR
WYNDHAM R. DUNSTAN, M.A., F.R.S., Director of the Scientific Department
of the Imperial Institute, London.

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Other PAPERS that may be consulted:

Imperial Institute Hand-book No. 9. Indian Coal.

The Agricultural Ledger No. 2 of 1895.



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(Mineral and Metallic Series, Vol. II.)

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[*Dictionary of Economic Products, Vol. II., C. 1414-41.*]

REPORT ON THE COAL SUPPLY OF INDIA.

Including results of the Examination of Selected Samples from the Principal Seams. (With Appendix containing Tables of Results.) By PROFESSOR WYNDHAM R. DUNSTAN, M.A., F.R.S., Director of the Scientific Department of the Imperial Institute, London.

The valuable and interesting report by Professor W. R. Dunstan, F.R.S., reproduced in these pages may be fittingly preceded by the following brief account of the manner in which the present inquiry originated.

In 1895 Sir F. A. Abel, Bart. K.C.B., Secretary and Director, Imperial Institute, forwarded to the Government of India in the Revenue and Agricultural Department a report upon the specimen of coal transmitted by the Department for exhibition in the Indian Section of the Imperial Institute and for the purposes of examination. The report included the results of the technical examination in the Research Department of the Institute of the whole of the samples and of the elementary analyses of those which were shown by that examination to be of superior quality.

In Sir F. A. Abel's letter on the subject, Flying Seal Series No. 41, dated 7th March, the following paragraph occurs :—

" In no instance was the sample received sufficiently large to permit of practical experiments, with a view to the determination of the calorific value, etc. Should experiments of this kind be desired in any particular instance, they can be carried out in the Research Department, provided one or two cwts. of the coal to be thus examined is forwarded."

PREPARATORY
NOTES

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COAL.	Report on the
PREPARATORY NOTE. Draw. pp. 25. Ed. of Reg.	<p>On the case being transferred to the Reporter on Economic Products for further action, those firms who had previously supplied samples, and others were invited to furnish about two cwt. of coal from their respective collieries for ascertaining the calorific value and chemical composition. A reminder was subsequently issued to the Managers and Proprietors of the collieries which had not responded to the original circular pointing out that the collection of samples already to hand was of so representative a character that it seemed undesirable that any collieries should be omitted.</p> <p>The second larger series of samples now reported on form the result of that correspondence.</p> <p>It may be mentioned here that out of 45 companies and individuals addressed, 28 furnished samples, and only 17 either did not reply (12) or declined to avail themselves of the offer placed before them (5).</p> <p>It may also be well to explain that the numbers quoted in Table II., column 1, and there described as Indian Invoice numbers are in reality the Indian Museum Registration numbers. Smaller duplicates of the samples furnished to the Imperial Institute were in every case retained in the Indian Museum both for purposes of verification and in accordance with the standing rule which provides that for every specimen despatched to the Imperial Institute an exact duplicate shall be retained in the Indian Museum. The advantages of this procedure are obvious. A London firm is thus enabled to communicate with its Calcutta correspondent, or vice versa, referring him to a sample exhibited in both the Imperial Institute and the Indian Museum under one and the same registration number.</p> <p>It need only be remarked that the Director's report on the coal supply of India together with the table of analytical results are printed in their entirety. The portion of the appendix containing the diagrammatic arrangement of the chemical analyses and the specially prepared map of India are not, however, reproduced. The only addition is that made to Table I. where the statement giving the outturn of the collieries for 1896 is brought up to date by inserting the official returns for 1897.</p>
Draw. p. 21.	<p>Introductory.</p> <p>At the instance of the Government of India an examination has been made in the Scientific Department of the Imperial Institute of C. 141421.</p>

Coal Supply of India. (W. R. Duran.)	COAL.
a number of large samples of coal taken from some of the principal seams in India, many of which have not been previously examined. The coals were collected under the supervision of Dr. George Watt, C.I.E., the Reporter of Economic Products to the Indian Government. Two series of samples have been received. The first series formed the subject of a report from the Scientific Department in 1895, which has been printed in the Indian "Agricultural Ledger," No. 2, of that year (<i>see also</i> "Imperial Institute Journal," Vol. 1, No. 4, p. 162, and "Annual Report of the Indian Committee of the Imperial Institute," India Office, 1897). The results of the analysis of this first and smaller series are, for convenience of reference, included in the table appended to this Report, being marked by an asterisk. The second, larger, and more representative series forms the chief subject of the present Report.	BIBLIOGRAPHY OF INDIAN COAL.
Literature.	CONT. P. 2.
In addition to the Report above-mentioned, the following works are of importance in connection with the history, occurrence, distribution, production, composition, and characteristics of Indian coal:—"Memoirs of the Geological Survey of India," 1871-97, papers by T. W. H. Hughes, F. R. Mallet, W. King, F. Nettling, J. Della Touche, P. N. Bose, etc.; Ball's "Geology of India," Vol. III., 1881; Watt's "Dictionary of the Economic Products of India," article "Coal," by Dr. W. Sasse, Manager of the East Indian Railway Collieries; "The Karharbari Coalfield, with some remarks on Indian Coal," by Dr. W. Sasse; "Proceedings of the North of England Institute of Mining and Mechanical Engineers," 1880; "Annual Review of Mineral Production in India" for 1896 by Dr. George Watt, C.I.E., Calcutta, 1897; "Imperial Institute Series of Hand-books of Indian Commercial Products, No. 9, Indian Coal," Calcutta, and Imperial Institute, London, 1893.	BIBLIOGRAPHY OF INDIAN COAL.
It will be convenient to briefly summarise here the chief points in connection with the occurrence, distribution, production and characters of Indian coal.	AGE OF INDIAN COAL MEASURES.
Occurrence.	
From the exhaustive investigations made by the Geological Survey of India, it appears that the Indian coal measures belong, like those in England and Wales, to the carboniferous period,	

COAL.	Report on the
BENGAL	but chiefly to the upper palaeozoic and lower jurassic formations. The coal occurring in the Peninsula, south of the Indo-Gangetic plains, belongs to the lower Gondwana period, whilst the extra-peninsular coal, e.g., that of Assam and Upper Burma, is principally cretaceous and tertiary. This difference in the occurrence of coal in India and Great Britain is important in accounting for many of the peculiarities in the composition and characters of Indian coal as compared with English and Welsh coal.
Exploration of Indian coal-fields not complete.	<i>Distribution.</i>
Frequent escapes of fire-damp. <i>Conf. p. 10.</i>	Coal is widely distributed throughout India, except in Bombay and Sind, the North-West Provinces and Oudh, Rajputana, and Mysore, where the mineral is either scantily distributed or entirely absent. Many of the coal-fields have not been fully explored and only a small proportion of the total known coal area is at present worked. The seams in Bengal and Assam are frequently from 50 and 80, to as much as 180, feet in thickness. The pits are often of considerable depth; at present the deepest appears to be about 700 feet. In many cases the working of the seams leads to the escape of little or no fire-damp, so that the miners are able to work with naked lights. In 1895, 235 collieries were at work, but in 1896 only 172 were in active operation. At the present time Bengal produces more than three-fourths of the coal mined in India. The localities and extent of the local production in India may be learned from the following summary, taken from the last published returns (1895 and 1896). The chief coal localities are figured (roughly to scale) in the map* which is appended to this Report. This map is one prepared for the "Hand-book" at the instance of the Indian Government in 1892. The principal railways, which are marked, are important in connection with the question of transport.
Over three- fourths of Indian Coal furnished by Bengal.	<i>ASSAM.</i> —The mines in Duffia, Khaisi and Jaintia Hills, the latter including the Cherrapunji mines, the Garo and Naga Hills, and the district of Lakhimpur, in which the extensive mines of Makum occur, are of considerable importance in relation to the railway extension in this Province. The thick seams of the Makum mines are being actively worked, and are estimated to furnish 18,000,000

* Not reproduced.—*Ed.*

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Coal Supply of India. (W. R. Durstam.)	COAL.
... In 1895, the production amounted to 173,717 tons; in 1896, to 177,359 tons. In these mines the boring is usually made horizontally into the hillside instead of by a vertical shaft.	BURMSE. TONE. Assam Mines Output.
BALUCHISTAN. —This Province produced 23,259 tons of coal in 1895, but only 10,572 tons in 1896, the chief mines being those of Khost and Quetta. Much of the coal is too friable to be of general use.	Baluchistan Coal Mines.
BENGAL. —In 1895 there were 218 collieries at work, producing 2,716,155 tons; in 1896, 154 collieries were worked, producing 3,037,920 tons, valued at Rs1,46,411. The principal fields are:— <i>Karherbari</i> (300 miles from Calcutta), covering 8 square miles and estimated to contain 136 million tons; <i>Raniganj-Barddhaman</i> (about 130 miles from Calcutta), covering at least 500 square miles, and representing 14 thousand million tons; <i>Jheria</i> , a few miles to the west of Raniganj, covering 300 square miles, and representing 465 million tons; <i>Bokaro</i> , close to the Jheria field, which covers 220 square miles in thick seams estimated to contain 1,500 million tons; <i>North Karanpura</i> , which occupies 473 square miles, representing 8,750 million tons; <i>South Karanpura</i> , which represents about 75 million tons; <i>Daltonganj</i> , covering 200 square miles, and representing about 11 million tons; <i>Bansgarh</i> , a small field, south of Bokaro, occupying 40 square miles and representing about 5 million tons. Other fields, at present not largely drawn upon, are <i>Talechir</i> , <i>Rajmahal</i> , and <i>Darjeeling</i> , where there is a narrow field of graphitic coal.	Bengal Coal Mines.
BURMA. —The most important fields are the <i>Thingadaw</i> on the Irrawaddy, and those on the banks of the Chindwin river near Kalewa. The output of coal in Burma amounted to 17,239 tons in 1895, and to 22,993 tons in 1896.	Burma Coal Mines.
CENTRAL INDIA. —In 1895, Central India produced 98,219 tons of coal; in 1896, 115,386 tons. The most important field, and the only one systematically worked, is that of <i>Umaria</i> in Rewah, which is only 34 miles from the Katni station on the East Indian Railway, and is therefore of great importance as a source of supply for the North-West Provinces and the Panjab. The Umaria field covers 3 square miles, and is computed to contain 28 million tons of coal. Other fields are those of <i>Sohagpur</i> , close to Umaria, covering 1,600 square miles; <i>Korar</i> , 9 square miles, and <i>Biorampur</i> , 400 square miles.	Central India Coal Mines.

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COAL.	Report on the
BENEFICIATION Central Provinces Coal Mines.	CENTRAL PROVINCES. —In 1895 the Central Provinces produced 122,776 tons of coal, but in previous years the amount was far greater. In 1896 it rose again to 141,185 tons. The principal mines are those of <i>Meikpant</i> , on the Great Indian Peninsula Railway, about 100 miles to the south-west of Jabalpur, and <i>Warora</i> , the latter, which belongs to the Government, is responsible for the increased production of 1896. Other mines are those of <i>Shahpur</i> and <i>Pench</i> , <i>Korba</i> , <i>Mand</i> , and <i>Rangark</i> ; the three latter, which are in the Mahanadi valley, cover over 1,000 square miles and include several seams of great thickness.
Hyderabad Deccan Coal Mines.	HYDERABAD. —The most important mine in Southern India is the <i>Singareni</i> , in the Dominion of the Nizam. The output in 1895 was 398,915 tons; in 1896, 362,681 tons; most of it went to Madras and Bombay. The Singareni coal is of especial interest as being at present the nearest to the large deposits of iron ore of the Salem district, some of which is of excellent quality (<i>see Annual Report of the Indian Committee of the Imperial Institute, India Office</i> , 1897). Little is at present known of the large coal-fields of <i>Kamaranum</i> , <i>Cherla</i> , <i>Chinner</i> , <i>Madarayam</i> , and <i>Boddadamel</i> .
Madras Coal Mines.	MADRAS. —The principal mines are the <i>Rajakaruppal</i> & the <i>Godavari</i> coal-fields, but they are scarcely yet in full working order. It seems probable, from the occurrence of both coal and iron ore in Madras, that before long an important iron smelting industry will be established in this Province.
Panjab Coal Mines.	PANJAB. —The <i>Dandot</i> mines of the Jhelum district contain three seams about three feet thick. In 1895 they produced 72,453 tons, which were chiefly consumed on the North-Western India Railway; in 1896 the production had risen to 79,017 tons. Other fields are those of <i>Pidh</i> , <i>Bhagowalla</i> , <i>Chitpahar</i> , <i>Hazara</i> , and <i>Bassas</i> , which, however, have not been fully explored.
Warora, C. P.	Mode of Working; Labour. For detailed information as to coal mining, coal companies, coal legislation and coal labour, reference must be made to the "Imperial Institute Hand-book on Indian Coal." The following accounts of mining in Bengal may be included here as indicative of the mode and conditions of Indian labour. "The system of working varies very much. At Warora, Central Provinces, where 100,000 tons per annum are won and by direct

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Coal Supply of India. (W. R. Dawson.)	COAL.
acting engines out of two shafts 200 feet deep, the system nearly approaches the English. No women work underground, and work is constant from Monday morning to Saturday night. The work time is divided into three shifts of eight hours each. The seams, which vary from 8 to 12 feet, are worked thus:—Galleries or boards and headways are driven 12 feet wide, and 6 feet in height, leaving the roof coal and pillars 40 feet square. The coal is so hard that it has to be nicked and undercut, and then blasted down. The pillars are worked by splitting each from one headway or another, and then taking the far end off in slices. The roof coal comes with it.	HOPES WORKERS: LABOUR. WAGES, C.P.
"At the Mohpani collieries a similar system is worked. The difficulties met with in these mines, owing to the faulted and disturbed nature of strata, are probably unequalled in India.	Mohpani.
"The Karharbari coal-field is mainly worked by three companies, the Raniganj Coal Association, the Bengal Coal Company, and the East Indian Railway. The system here is similar to that obtaining all over Bengal. The working hours are from 6 A.M. to 6 P.M., and, perhaps, later, when extra work is required. Only four days a week real work is done, and the consequence is that collieries must have a far greater number of working places than the same output in England would warrant. All the miner's family work with him, carrying or training his coal. Picks of English pattern and make are now universal, the crowbar and single pick having been ousted. The workings are on the bord and pillar system. Pillars vary from 12 feet to 40 feet square and 40 feet by 60 feet. In the shallow mines and thin seams (7 to 8 feet) the former size obtains; in the thick seams (from 12 to 20 feet) the latter. Pillars are worked in the 8-feet seam in the following manner:—A 4-feet chock is placed between each pillar in the row of pillars (generally six in number) that are to come out. A chock is also placed in front of each; the pillar is then attacked from the front side. When pillars are taken out, the chocks are withdrawn and the roof falls.	System practised in Bengal. Karharbari.
"The remarks on the Raniganj coal-field given below apply in some measure to this field. Of sinking, coal cutting, the miner's love of holiday, lighting of mines, etc., the description in one case is a description in the other. Payments in this coal-field are weekly, on Sunday mornings, the miners resorting from the pay offices to the East Indian Railway bazar, which was established to attract local	

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Mops of WORKERS: Labour System prevailed in Bengal.	<p>labour, and which has done so. The labourers consist of low class Mussulmans and Hindus, as also aborigines,—Santals and Kols. There are some Baoris, brought from Bengal to teach the local men how to cut coal. The local men, however, cut coal better, as they have discarded the Baori <i>sabot</i>. Local labour is more tractable, and the Baoris are not in such requisition as formerly.</p>
Drainage.	<p>“Drainage is effectively carried out by Tangye's special air lifting and forcing pumps, worked by bob-levers from horizontal engines. The machinery is of good type, and winding and hoisting are done by good engines. Ventilation is attended to in the deep mines, mainly by furnaces or steam-jets.</p>
Miners' dwelling.	<p>“The miners live in small villages, aggregations of huts of mud walls of bricks set in mud with thatched or tiled roof. The hut consists of one room, sometimes two, of from 6 feet by 6 feet to 10 feet by 10 feet in size. Those better off have cow-sheds and granaries; these two latter with the dwelling forming three sides of a quadrangle. The larger proportion of the labourers cultivate during the rainy season, and work at the collieries only in the cold season, say from October to June. Some of the labourers have settled down to coal cutting as a calling, and these work constantly, always excepting Monday, which is invariably a holiday.</p>
Rates paid to miners.	<p>“Coal cutting is paid for by contract at so much a tram or bucket. These are of various sizes. The price generally amounts to from 7 to 8 annas per ton for large, and 1½ to 1¾ annas per ton for small coal. All other work as stone cutting, sinking, rail-laying, etc., is paid for by daily wages.</p>
Classes of coal.	<p>“The coal is hand-picked into four kinds. Steam is larger than 2-inch cube, rubble larger than ½-inch cube, smithy down to ½-inch cube, and all smaller than that is called slack or dust. This picking or screening is done by contract, and for rubble and smithy the coolies get about 4 annas per ton. Slack is not paid for. Loading is done by hand into the railway wagons. At the mines tipplers are used for discharging the coal from underground trams into the wagons that run in the narrow-gauge tramways.”</p>
Raniganj.	<p>The following notes on the Raniganj coal-field are by Mr. T. H. Ward :—</p> <p>“The Chord line, East Indian Railway, passes across this coal-field, and the collieries are clustered on either side and along the Barakar branch, sidings and branches, up to six miles in length</p> <p style="text-align: center;">C. 1414-41.</p>

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<p>built by private enterprise, connect most of the collieries to the main line. Here winding engines, wire-rope guides, and tipplers, and the regular paraphernalia of an English colliery are fast supplanting the primitive 'gin' and bucket of a few years ago. These gins were (and sometimes are still) turned by women, 25 to 30 being employed on each gin. They kept time to a monotonous chant which they sang as they tramped round and round. The sinking in the district is easy, through soft sandstones, no brickwork being required to protect the sides. Heavy water is sometimes met with.</p>	MINE of WORKERS: LABOUR. Systems practised in Bengal. Barakar.
<p>"The coal in the east of the field is very strong and non-caking. The sandstone roof is also very strong, and comes right down into the coal. Practically no timber is required in working the coal in the manner described below. In the west of the field, at Sanctoria for instance, the coal is not so strong, though the roof is everywhere the same. From Belrooij near Sitarampur, westwards, the seams worked are all coking coals.</p>	Thickness of seams.
<p>"The seams worked are seldom less than 10 feet and sometimes reach 11 feet, in thickness. In the Barakar Coal Company's Kumar-dubbi Colliery and the Bengal Coal Company's Liakdee Colliery on the west of the Barakar, the enormous thickness of upwards of 80 feet has been found.</p>	Plan.
<p>"The mine is laid out underground on the same plan throughout the district. This plan has been stereotyped all over the field, and is adopted without reference to its suitability to the different conditions obtaining in the various seams worked. Indeed, it has been adopted apparently more with reference to the prejudices of the native miner than from economical considerations. Galleries are excavated to the full height of the seams 12 feet to 16 feet wide, leaving square pillars of varying sizes to support the roof, many acres being thus often left on pillars. The native cooly insists (and he has his own way very much in this coal-field) on commencing operations at the roof and working downwards until the full height of the seam has been excavated. His chief and dearly-prized weapon is a 'sabai' or crowbar with sharp point at one end. With this he smashes the coal, standing always when at work. He never groves beyond the first 'cleat.' Gangs of four or five men occupy each gallery. They are paid by the bucket or tram of steam coal or small delivered at the pit bottom. If any timber has to be set</p>	Galleries. Usual mining implement.

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Wages: Labour. System practised in Bengal. Bengal.	up in a working place, a man of the carpenter caste ("Chowr") who is paid a daily wage, must be sent for the purpose.
Seams.	" Women and children work underground, and are principally employed in carrying the small coal and dust. They are also paid by the tram or bucket. The women often take their babies, two and three months old, down the mine, taking with them also a small cot on which the child sleeps or plays while its parents are at work.
Shafts.	" Access to the mines is very generally by inclines opening to the surface.
Fire-damp. See p. 4.	" In the eastern part of the district the seams are for the most part flat, in the central and western parts the strata are often steep (the general dip being southerly), and intrusions (dykes) of trap rock become more frequent. The deepest shafts are about 250 feet, the largest part of the coal yet won being from much less depths. Some fire-damp has been met with in the western part of the district. Chanch Colliery (west of the Barakar), belonging to the Bengal Coal Company, was abandoned some years ago after an explosion in which several men were burnt, some of whom died. At Sanctoria, also belonging to the Bengal Coal Company, some men were burnt in 1883.
Principal coal-cutting or mining caste.	" The collieries of Kumardubhi and Liakdee have already been mentioned. Thousands of tons of coal have been won from the outcrop merely of these magnificent seams, and thousands of tons still remain to be worked without indenting on their resources at any greater depth.
Customs of the district to pay wages daily.	" The 'Bauri' is the principal caste which supplies coal-cutters for the district. In some respects the Bauri colliers' characteristics are amusing, like those of his western prototype. He is very fond of getting drunk, especially at the week ends, and very disinclined to go to work on Mondays. He is good tempered and improvident; it is a difficult matter to persuade him although he is always paid a 'ticca' (contract) rate for his work and could easily increase his earnings, to do more than will, with his wife's contributions, keep the household in rice and himself in drink for the day. The nearly universal and very bad custom in this district is to pay each evening for the work done during the day. The collier or cooly has often to wait about until 8 or 9 P.M. for his money. He then goes cheerfully home, and remains up half the night drinking and singing with his companions (he is very social in his habits), incompre-

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hensibly happy with his timeless tom-tom. In the morning he trudges back, very often seven or eight miles (a distance of course travelled twice a day) to work and is down the pit at 9 or 10 A.M. All day, in the intervals of work, he sucks the comforting bubble-bubble.*	HOPE OF WORKING LABOUR. System performed in Bengal. HIMALAYA.
"The light which the collier carries with him is exceedingly primitive. He gets an allowance of oil in proportion to the number of tons of coal he cuts. Every morning he draws at the godown sufficient for his requirements during the day with an allowance of cotton thread or old rags to serve for wick. This oil he burns in a 'chiragh,' or small piece of stone hollowed out into the shape of a boat (a piece of tile from the roof of his house is often substituted). In this he places a small quantity of oil and a portion of wick. Any oil he can save from his allowance is his perquisite, and he can carry it home. <i>Mahas</i> and castor oil are the chief oils used. Some of the mines are lighted by kerosene, burnt in small tin lamps holding about two ounces, with small circular wicks. The native does not like this plan so well, as he cannot use it to rub on his body or to season his food, a purpose for which <i>mahan</i> oil is used.	Allowances of oil for lighting purposes.
"The ventilation of the underground workings receives very little attention, and in most collieries none at all. The great freedom from fire-damp, and the lofty seams exploited, have kept this question in the background. The ignorant native has not yet realised that his health and longevity are in question, and he has besides helped much to prevent ventilation becoming a necessity, by the wonderful power of endurance he has shown, and which enables him to work for hours at the bottom of a sinking shaft with water pouring over his naked body, or to work all day long, or day after day in driving a 'rise' gallery, perhaps hundreds of feet from any current, in an atmosphere which is fetid and laden with steam. This is a blot on the mining of the district and ought to be speedily removed.	Ventilation.
Production.	Great staying powers of native miners.
The increase in recent years of coal production in India is very remarkable. In 1895 it amounted to no less than 3,537,820 tons valued at Rs. 28,81,352. This is nearly half as much again as that for 1894, and an increase of more than 50 per cent. as	Conf. Table I, Appendix, p. 92.

* *Syn. for native hook or pipe.—Ed.*

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PRODUCTION	compared with the average for the three previous years. In 1895, the quantity was greater still, 3,848,013 tons. These figures would seem to be a trustworthy indication of an increase in the general commercial and industrial prosperity of India, since the amount consumed for domestic purposes is inappreciable, nearly the entire quantity being consumed in steamships, railways, and factories. The average price of Bengal coal is Rs per ton at the pit's mouth. Picked coal sells at from Rs 3 to Rs 4 a ton.
Price.	The output for 1896 [and 1897] of the principal collieries is given in a Table appended to this Report. (Table L.)
Conf. p. 21.	
Marked feature in Imports.	Imports and Exports. The imports of coal from foreign countries into India in 1894-95 amounted to 808,713 tons, more than three-fourths of which were taken by Bombay. In 1895-96 the imports fell to 746,850 tons.* Nearly the whole of the foreign coal is derived from the United Kingdom; Australia, and, in a smaller degree, Japan are among the countries whose exports of coal to India show a considerable advance, although together their output is less than one-twentieth of that of the United Kingdom. The statistics of the last few years show that India is relying more and more on her own fields as a source of supply, the increase in the amount of coal imported being small as compared with the enormous advance in the amount produced internally. It may be safely concluded that the complete cessation of foreign imports of coal is only a matter of time.
Foreign Coal which Received.	With regard to the export of coal from India; in 1895, 53,565 tons, representing a value of Rs 5,00,226, left the country; in 1896, the exports reached 79,989 tons.† Nearly the whole of this went to Ceylon, not for internal use, but to meet the large demand for steam traffic at Colombo. Ceylon now obtains from India what she formerly took from Europe, and chiefly from the United Kingdom. It is stated that complaints have been recently made that Bengal coal is too "dirty", to be suitable for use by the Ceylon Railways. This is a difficulty which ought to be easily overcome, for there is plenty of suitable locomotive coal in Bengal.
Indian Coal, whether exported.	Chemical Examination. The chemical examination of the various samples of Indian coal has been confined, in the first instance, to those points which are of

* Corresponding figures for 1896-97 481,036 tons.

† ↑ " " " 133,478 "

Coal Supply of India. (W. R. Denslow.)	COAL.
importance in determining the general quality of each coal, and in indicating the particular purposes for which it is suitable. In certain cases these data have been supplemented by ultimate analysis (combustion) for the determination of carbon and hydrogen. The constituents which have been determined are : <i>fixed carbon</i> , perhaps the most significant datum not only in reference to the value of the coal as such, but also as affecting the quality of the coke (<i>i. e.</i> , fixed carbon and ash) obtainable from it; <i>ash</i> , or mineral matter, a high percentage of which is characteristic of an inferior coal; <i>volatile matter</i> , including bituminous constituents, gas and water; <i>sulphur</i> , a large proportion of which is objectionable for most of the purposes for which coal is employed, and especially for the smelting of iron.	CHEMICAL EXAMINATION.
In addition to the foregoing constituents, an approximate determination has been made of the heat-producing power of the principal coals by ascertaining the <i>thermal value</i> or <i>calorific equivalent</i> . The general characters and caking quality of each coal have also been recorded.	Calorific value.
Methods of Examination.	Manner of sampling.
For purposes of reference the following particulars of the methods employed are given :—	Fixed carbon, volatile matter, ash, how determined.
Sampling. —Pieces of several pounds weight were sawn from the large blocks, weighing from $\frac{1}{2}$ —1 cwt. in most cases, which formed the specimens, and these were completely broken up and averaged. The specimens generally, as received, were stated to be fairly representative of the seams from which they were taken.	
Technical analysis. —The percentages of fixed carbon, volatile matter, sulphur and ash were determined under the following conditions :—	
About 0·3 gram of the finely-powdered coal was weighed out into a tared platinum crucible; the latter was supported 12 inches above the working bench, and heated over a No. 8 Fletcher-Bunsen burner, working at full power for two minutes; it was then immediately subjected to a blow-pipe flame for two minutes longer, being kept at a bright red heat. After cooling in a desiccator it was weighed and the loss reckoned as volatile matter, which, of course, included moisture. The well-fitting lid of the crucible was not removed during the whole of this process. In the case of caking coals a very small	

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Determination of sulphur.	<p>quantity of soot sometimes remained on the under side of the lid and escaped combustion. These determinations were made in duplicate, and passed if the difference was not more than 0·3 to 0·4 per cent, at this stage. The crucible was then put into a muffle furnace with the lid half off, and heated until nothing but ash remained, when it was cooled in the desiccator and weighed. The loss was reckoned as fixed carbon, and the residue as ash; the colour of the ash will be found recorded in the tables.</p>
Determination of sulphur.	<p>For the estimation of the sulphur about 1·5 grams of coal were fused in a platinum dish, with 30 grams of the following fusion-mixture:—Sodium-chloride, 4 parts; potassium nitrate, 3 parts; sodium carbonate (dry), 1 part. The mixture was slowly heated, and, after a short time, it deflagrated and became liquid; when cool it solidified into a white cake, which was dissolved in boiling water; the solution was filtered, acidified with hydrochloric acid, and, while quite hot, precipitated with barium chloride. By keeping the beaker and its contents warm on the water-bath for three or four hours, the precipitate of barium sulphate was obtained in a granular form very suitable for filtering. Most of the filtering was done through a ske of asbestos placed in the bottom of a perforated platinum crucible, with the help of a water pump; this being a modification of Gooch's method. Careful test-experiments showed that, in point of accuracy, this method was at least equal to that ordinarily used, <i>sic.</i>, igniting the precipitate of barium sulphate in a crucible; it is for speed much to be preferred. These estimations were made in duplicate, a difference of 0·3 per cent. being considered quite allowable after considerable experience. In some cases the sulphur left in the coke was estimated.</p>
Drying.	<p><i>Ultimate analysis.</i>—This was conducted on selected coals in the usual manner. The coals were first dried in a current of hydrogen gas at 120° C. for half-an-hour; this was done by pushing the platinum boat containing the weighed quantity of coal into the centre of a long piece of wide glass tubing, which itself was passed through the walls of a saucepan. Hydrogen was led in at one end and allowed to diffuse through a small piece of fine tubing packed with cotton wool, inserted in a cork at the other end. A burner was lighted under the saucepan, and a thermometer fixed into a hole in the lid; a very convenient air-bath was thus obtained. The coal,</p>

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Coal Supply of India. (W. R. Dunstan.)	COAL.
after being dried, was then burned in the usual way in a piece of hard glass tubing. The tube used was filled to a length of 15 inches with copper oxide (iron wire), and to the extent of 4½ inches with lead chromate, these materials being kept in position by plugs of fine copper gauze. The total length of the tube was about 34 inches. It will be noticed that the amount of ash, as determined in the combustion, was in some cases distinctly higher than when estimated by the technical method. This is doubtless due to the presence of iron and other mineral substances in the ash, which are left in a higher state of oxidation after being heated in oxygen.	ANALYSIS. Burning.
The Calorific Equivalent has been determined by means of Thompson's calorimeter, the apparatus being previously standardised by the combustion of material of known calorific value and the necessary correction applied to the experimental numbers. The results are stated in large calories.	Thermal or calorific value.
The services rendered in connection with the experimental work by Dr. F. Lühn, Special Assistant Chemist in the Scientific Department, and by Mr. A. M. Crighton, Junior Assistant Chemist, merit official record.	Acknowledgment of services.
Results.	
The results obtained in this examination are given in the tables appended to this Report, the various samples of coal being arranged under the provinces from which they were obtained (Table II.). For convenience of comparison, and also to render possible a general survey of the figures, they have been plotted in curves on the diagram * which is appended. A table of previous analyses of Indian coals is also given, to which is added, for comparison, analyses of typical British coals (Table III.). To those familiar with the technical valuation of coal the data need little explanation or comment. It will be seen at once that Indian coal varies much in composition and quality. Most of it is quite suitable for ordinary purposes, whilst some of the samples, e.g., certain of those from Bengal and Central India, are of excellent quality, equal to that of some of the best British coals. It may be useful to draw attention to the characteristics of the coal of each district.	Conf. pp. 18, 23 and seq. Conf. p. 38 to end.
ASSAM.—The coal from Makum is regarded as one of the best of the Indian steam coals, though this is scarcely borne out by the	Conf. p. 40.
	Variation in quality of Indian Coal.
	Makum.

* Not reproduced.—Ed.

COAL.	Report on the
BENGTZIE. Assam Coal. Cony. p. 27.	two samples now reported on. The ash is remarkably small, but the sulphur is high. Neither of the two samples examined contained the very high percentage of fixed carbon (75·7 per cent.) recorded by Mr. F. R. Mallet in his 'Memorandum on the Coal-fields of Assam (1876), (see Table III.). One of the samples gave a rather soft coke containing much sulphur, the other was non-caking.
Cherrapunji. Cony. p. 26.	The sample from <i>Cherrapunji</i> , though low in ash, contains much sulphur. It is, however, a hard caking coal, burning like cannel. The sample examined differs considerably from that reported on by Mr. James Prinsep (see Table III.). An account of the Cherrapunji field has been given by Mr. T. De la Touche ('Records of the Geological Survey of India,'—Vol. 22, Part 3, 1884). The sample from <i>Mao-kong</i> is similar to the other Assam' coals, but differs very much from the two samples analysed by Mr. F. R. Mallet (see Table III., 'Records, Geological Survey of India,'—Vol. 4, 1875). The sample from the <i>Dikhu Valley</i> is a non-caking bituminous coal.
Noticeable first record- ing Assam Coal. Khost.	All the Assam coals are remarkable in being comparatively free from mineral constituents (ash). They are probably serviceable as steam coals, but the samples examined contain too much sulphur for use in iron-smelting.
Killa-Makim.	BALUCHISTAN. —The <i>Khost</i> coal is tertiary and somewhat bituminous. Of the two samples from the Khost colliery, that from the Khost seam is probably a serviceable caking steam coal, containing, however, a large proportion of sulphur. That from the <i>Killa-Makim</i> seam contains little sulphur, and has the characters of a fair caking coal which furnishes more heat when burnt than would be anticipated from the analytical numbers.
	BENGAL. —The coal in Bengal varies greatly in quality; much of it is excellent, the fixed carbon ranging between 50 and 60 per cent., and the calorific value exceeding 6,000 cala. (= about 10 British thermal units), whilst the ash often does not much exceed, and in some instances falls below, 10 per cent., and the sulphur is frequently present in but very small proportion. A great deal of the Bengal coal is serviceable steam coal. Many samples cake well and contain little sulphur, and the coke is therefore suitable for iron smelting.

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Leger.

Coal Supply of India. (W. R. Dunstan.)	COAL.
The fifty-three samples of Bengal coal were derived from the following collieries :—	RESULTS. Bengal Coal.
Raniganj.	Sanctoria.
Bankar.	Searsole.
Kumardubbi.	Jemehiri.
Rajper.	Madhubpur.
Loyabed.	Daltonganj.
Petana.	Buggutdeah in Jheria.
Karharbari (Giridih).	Barmondia.
Sodepur.	Luchipur.
Liakdee.	Ghoosick.
Nimcha.	Baratchak.
Koildeab.	Chattabad.
Jeyramdangah.	Moulkara.
Dhadka.	Nandi.
Belrooij.	Kalipahari.
Borrea.	Kustore.
Sainpur.	Patlabari.
The analyses of Karharbari coal agree well with those published by Dr. Saiso (Table III.). From this coal a considerable quantity of coke is produced, at present chiefly in the Anchor rectangular oven, partly for locomotive service and partly for use in the East Indian Railway Company's foundry at Jamalpur.	Karharbari. Conv. p. 26.
The Barakar coal has the reputation of being a first-rate steam coal, and a certain quantity of coke containing very little sulphur is produced from it. Sanctoria coal is considered to be a good gas coal, so also is the Giridih coal, which is used by the Calcutta Gas Company.	Barakar. Sanctoria. Giridih.
BURMA. —Only two samples have been received from the Burma Coal Company. The origin of the coal is not stated, but it is probably derived from the Shwebo district, about 60 miles above Mandalay and four, or five miles from the Irrawaddy. That from the roof of the seam is an inferior non-caking coal difficult to burn, so that its calorific equivalent could not be ascertained. That from the floor of the seam is valueless, being nearly incombustible and little better than shale.	Shwebo.
CENTRAL INDIA. —The Umaria Government Colliery in the Rewah district, from which all the samples came, produces coal	Umaria.
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COAL.	Report on the
SHIVSIL. <small>(Central India Coal Co., p. 30.)</small>	of various qualities. None of it is first-rate or equal to the Bengal coal, the ash being high and the fixed carbon and the calorific equivalent small. The sulphur, however, is not excessive, and the picked coal may be serviceable for locomotive use and for some other purposes. It does not cake and therefore cannot furnish coke. None of the present samples are equal to that analysed by the Geological Survey in 1884 (Table III.).
Mohpani. Warora. Gadawarra. <small>Con. pp. 29.</small>	CENTRAL PROVINCES. —Four samples were received from <i>MeApant</i> , six from <i>Warora</i> , and three from <i>Gadawarra</i> . The Mohpani samples, sent by the Nerbudda Coal and Iron Company, are non-caking coals of fair quality, the sulphur is small, but in two samples the ash is high. They are inferior to the sample of which an analysis is on record (Table III.).
	The samples sent from the Government Colliery of Warora are all non-caking coals resembling those from Mohpani; the fixed carbon is, however, usually lower and the sulphur higher. There is said to be excellent iron-ore and limestone in the Warora district, which might be worked if a caking coal could be found. At present nearly the whole of the output of the colliery is employed on the Great Indian Peninsula Railway with which the colliery is connected by a branch railway joining the main line at Wardah Junction, about 50 miles distant.
Hyderabad (Singareni).	The Gadawarra coal is somewhat similar in its proportion of fixed carbon. In two samples the ash is high but the sulphur low. This coal differs from that of Mohpani and Warora in caking well. The Gadawarra seam is not far from the Mohpani and close to the Gadawarra station on the Great Indian Peninsula Railway, about 80 miles from Jabalpur.
Dandot, Pidh, Baghawalla, Shahrig.	NIZAM'S DOMINIONS. —The two samples of coal from Hyderabad (Singareni) are of fair quality as steam coals. One does not cake, and the other only slightly. In one the sulphur is low, in the other rather high, and the same remark applies to the ash.
	MADRAS. —No samples were received from this Province.
	PANJAB. —The samples were obtained from <i>Dandot</i> , <i>Pidh</i> , <i>Baghawalla</i> , and <i>Shahrig</i> . The Dandot sample is a good non-caking steam coal, with a relatively high calorific value, though low in fixed carbon. The Pidh is a similar but rather better non-caking steam coal with a somewhat high proportion of sulphur. The Baghawalla is an inferior coal which cakes slightly. The

Coal Supply of India. (W. R. Denison.)	COAL.
coal from the Takrai seam of the Shahrig district is a bituminous caking coal with a low percentage of fixed carbon but a relative high calorific value, depending on the presence of solid hydrocarbons. It is probably a serviceable but fast burning coal. One sample of shale from Pidh and another from Dandot were examined for mineral oil and gas. In both cases the result was unsatisfactory, neither specimen furnished any appreciable quantity of oil, whilst the Pidh shale produced rather more than one-half and the Dandot shale less than one-fourth of the quantity of gas obtained from good English coal, and the gas was of poor illuminating power.	RESULTS. Panjab Coal.
The information contained in this Report as to the Coal Deposits of India, together with the results of the analyses of samples taken from some of the principal seams, will, it is hoped, be the means of directing attention to the possibilities of industrial enterprise which India offers through her enormous coal supply.	CONT. p. 2.
Samples of the coal referred to in this Report, and in some cases of the cokes furnished by them, may be seen in the Indian Collections of the Imperial Institute.*	

* Duplicates may also be inspected at the Indian Museum, Economic and Art Section, Calcutta.—*Ed.*

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Report on the Coal Supply of India.

COAL

APPENDIX.

Table I.

Output of Indian Collieries in 1896 and 1897.

APPENDIX

Province and District.	Name of Mine.	When opened.	By whom worked.	Output of Coal in		
				1896.	1897.	
Assam— Lakshimpur (Bar- non river).	Tibik . . .	1863	Joint Stock Company — Assam Tea Company —	Tons. 177,150 ... 98 ... 177,350	Tons. 184,371 931 130 184,333	
	Lado Valley . . .					
	Upper Lado . . .					
	Ting . . .	1897				
Kaziranga . . .	Mandong . . .		Assam Tea Company —	98 ... 177,350	931 130 184,333	
	Dihka Valley . . .	1854				
Galakay Dalkhola . . .				Total for Assam . . .		
				177,350	184,333	
BASCHISTAN . . .				Total for Baschisthan . . .		
				16,572	8,876	
Bengal— Burdwan . . .	Kheat . . .	1897	North-Western Rail- way, Private, Coal Mines.	Tons. 1,783,437 14,073 665,919 571,350 1,549	Tons. 1,013,086 9,882 660,605 434,130 8,876	
	Burdwan . . .	1893				
	Naxartibagh . . .					
	Mankham . . .					
South Bengal Perganas . . .	South Bengal Perganas . . .		Total production of South Bengal Perganas District Col- leries.	Tons. 95	1,391	
	Darjeeling . . .					
Total production of Bengal Collieries . . .				3,037,690	3,143,467	
Burma— Shweta . . .	Lekhpalin (Thinga- daw).	1892	Tons. ...	Tons. ...	...
	Theinmyo . . .	Tondawng . . .				
Total production of Burma Collieries . . .				33,000	18,471	
Central India— Bhopal . . .	Umaria . . .	1864	Government —	Tons. 115,385	184,778	
Total for Central India . . .				115,385	184,778	
Central Provinces— Narsinghpur Chanda . . .	Mohani . . .	1863	Joint Stock Company Government	Tons. 10,540 121,643	Tons. 10,975 110,654	
	Watra . . .	1871				
Total production of Central Provinces Collieries . . .				141,185	121,629	
Kashmir's Dominions . . .				Tons. 103,681		
Kashmir . . .				103,681	105,350	
Punjab— Jalandhar . . .	Rajahsangeli . . .	...	Godavari Coal Com- pany, Ltd.	Tons. 1,737	...
	Deodot . . .	1866				
Punjab— Jullundur . . .	Pith . . .	...	North-Western Rail- way, Do.	Tons. 79,617	79,647
	Boghaawali . . .	1893				
				6,137	6,145	

Here.—The figures of cutters for rags being now to hand, it has been thought desirable to add them to the foregoing table.—*S.A.*

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COALS

Report and Test.

TABLE

Tabulated Results of

Indian Bureau Number	Sample Number	Date.	Mine.	Whence received.	Remarks made on forwarded sample.
ASSAM.					
*136	705	4th Oct. 1894.	Mahan	Assam Railway and Trading Company (Loko Valley).	—
693	706	11th Jan. 1895.	Do.	Assam Railway and Trading Company, Limited.	i.e.v. Mahan and
*90	1445	4th Oct. 1894	Cherrapuri	Cherrapuri Coal-field.	—
*91	1446	Do.	Maodong	Maodong Coal-field	—
893	7778	8th Nov. 1894	Dikha Valley	Dikha Valley Colliery, Assam, Assam.	—
BALUCHISTAN.					
*93	1448	4th Oct. 1894	Khost Colliery	Khost Colliery, Khost town.	—
*94	1449	Do.	Do.	Khost Colliery, Killa Mahim town.	—
BENGAL.					
*99	1448	Do.	Kamarabhi	Bengal Coal Company, Kamarabhi Colliery.	—
765	7311	13th July 1894.	Do.	Bengal Coal Company	One box of steam coal from Kamarabhi Colliery.
*1661	2865	4th Oct. 1894.	Raniganj	Bengal Coal Company, Limited, Raniganj coal.	—
794	7454	29th July 1894.	Do.	A. Whyte, Esq., Ran- ganj.	Coal from the village of Chowrah, a village near of Topaz River Station on the East India Railway, and belonging to the Ran- ganj district.

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Coal Supply of India.										CORR.
Classification of Indian Coals.										APPENDIX Tabulated Results.
Rank	Specific Gravity	Specific Heat	Vol. Pct.	Calorific Value	Vol. Pct.	Vol. Pct.	Vol. Pct.	Caking Proportion	Colour of Ash.	Other Characteristics of the Coal.
100	1.348	0.98	54'20	45'45	1'07	Does not cake.	Pale chocolate.			
101	1.344	0'98	54'20	45'35	1'07	Cakes . . .	Reddish brown			A glistening black coal, clean to handle, easily broken, conchoidal fracture.
102	1.344	0'98	54'20	45'35	1'07	Do. . .	Dark red			Very dirty and dusty coal, breaks readily with irregular fracture, alternately dull and bright.
103	1.344	0'98	54'20	45'75	1'08	Do. . .	Yellowish brown.			A dull black coal, dirty, very hard, with cuboidal fracture.
104	1.347	0'98	54'75	47'85	1'08	Do. . .	Dark reddish brown.			Bright and clean with fossil resin in many places.
105	1.349	0'98	53'75	46'45	1'43	Does not cake.	Dark reddish brown.			A very bright coal, black as pitch, and of conchoidal fracture; intersected with dull layers, and thin layers of a clayish mass.
106	1.350	0'98	54'75	48'97	1'13	Cakes . . .	Terra-cotta			Clean, bright and hard but disintegrating with a white efflorescence, and with evolution of sulphuretted hydrogen.
107	1.350	0'98	54'75	48'94	0'74	Do. . .	Yellowish brown.			Clean, bright and hard, with obtuse fracture,
108	1.348	1.378	65'32	44'07	0'53	Do. . .	Grey			Layers of dull and bright coal, clean rounded fracture.
109	1.325	1.476	68'30	33'70	0'63	Do. . .	Dove			Dull, with bright patches, fairly tough and clean.
110	1.305	13'25	54'00	45'90	1'58	Do. . .	Fawn			Bright, hard and dirty.
111	1.330	11'15	60'74	30'30	1'47	Does not cake.	Light fawn			Dull, with bright patches, rather tough, clean.

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COAL.

APPENDIX.
Specimens
Received
during
the year

Report on the

TABLE

Sample Number.	Date.	Mine.	Whence received.	Remarks made in forwarding sample.	
BENGAL—contd.					
7700	7th July 1896	Raniganj	A. Whyte, Esq., Raniganj.	Coal from the village Kharbari belonging to Pundit Ezzam, situated 3 miles N.W. of Raniganj and belongs to the Lower Raniganj series. In the same a band of 1 foot very dark red carbonaceous clay divides the mass into two, the top coal is 4 feet 6 inches in thickness, of bright appearance, the bottom coal is 6 feet 4 inches in thickness and is a heavier and duller looking coal.	
8184	25th Nov. 1896	Raghunath Chock.	Jagannath Coal Company, Raniganj.	Raghunath Chock coal.	
9651	14th Oct. 1896	Banskar	Banskar Iron Works	.....
7347	20th Mar. 1896	Do.	New Banskar Coal Company, through G. Alexander, Esq.	Coal taken from an incline just being opened out, situated three miles from Banskar on the Jharia Broad Gauge Railway. Taken three feet below the surface.	
7740	7323	15th June 1896	Rajpur	Manager, Rajpur Coal Company, Banskar.	Coal from Rajpur Colliery, as woody obtained.
7746	7317	20th June 1896	Petana	Messrs. Mylne & Co., Proprietors, Petana Colliery, Banskar.	Petana steam coal.
7808	7311	12th July 1896	Loyabed	Manager, Banskar Coal Company.	Steam coal from Loyabed Colliery.
7866	7312	Do.	Do.	Do. (A special part which was roughly ovalised.)	
9650	19th	4th Oct. 1896	Karharbari	East Indian Railway, Karharbari Colliery, Jagiand region.

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Coal Supply of India.

COAL

APPENDIX.
Tabulated
Results.

11-month.

Calorific Value	% Volatile Matter	Ash per cent.	Calx per cent.	Water per cent.	Sulphur per cent.	Caking Proportion	Colour of Ash.	Other Characteristics of the Coal.
5000	50.00	17.00	20.00	30.00	1.00	Cakes	Dirty brown	A dull, silty coal with bright patches, breaks easily, clean.
5000	47.00	14.00	20.00	30.00	0.00	Does not cake	Greyish pink	Alternate layers of bright and dull coal, dirty, breaks easily with much dust.
5000	53.00	18.00	21.00	28.00	0.00	Cakes	Greyish white	Dull black, dirty, very hard.
5000	41.00	10.00	21.00	38.00	0.00	Do.	Dirty white	Dull black coal with bright patches in places, cleaves occasionally with a silty fracture, clean.
5000	55.00	18.00	24.00	28.00	0.47	Does not cake	Do.	A dull coal with bright patches, fairly tough, conchoidal fracture,
4900	54.00	10.00	64.00	25.00	0.00	Cakes	Do.	Glistening coal composed of dull and bright portion, former tough, the latter readily broken. Occurs in well-defined layers,
4900	60.00	13.00	22.00	36.00	0.07	Do.	Light grey	Exhibits a peculiar curved fracture. Part of the sample was of dull appearance and very tough, while the remainder was bright and broke readily into small fragments.
4900	55.00	15.00	74.00	25.00	0.91	Do.	Do.	
5000	50.00	10.00	27.00	32.00	0.00	Do.	White	Laminated, very clean, cleaves in small cubes.

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COKES

Report on the

TABLE

Ref. No.	Date Received	Date Despatched	Despatched To	Despatched By	Where received.	Remarks made in forwarding stamp.
BENGAL—contd.						
450	195	5th Oct. 1894	Kharbari		East India Railway, Kharbari Colliery, Lower seam,	—
461	195	Do.	Do.		East India Railway, Kharbari Colliery, Upper seam,	—
7044	205	31st Jan. 1895	Do.		Manager, Gridh Colliery Company, Limited.	(Kharbari Besse from Pt. Pota- rakh, Gridh Coalfield.)
8117	2050	6th Jan. 1895	Gridh		Superintendent, Bengal Coal Company, Limited.	Shant coal, Girnar
9169	2060	4th Oct. 1894	Sodpore		Bengal Coal Company, Limited.	Sodpore coal
9169	2063	Do.	Lakhsa		Do. do.	Lakhsa coal
9169	2064	Do.	Nimcha		Do. do.	Nimcha coal
9169	2065	Do.	Koddish		Do. do.	Koddish coal
801	7453	11th Aug. 1894	Jayramnagar		Managing Agent, New Barbhoor Coal Company.	Coal from Jayramnagar new seam.
806	7468	Do.	Dhaka		Do. do.	Coal from Dhaka, low seam.
8083	7481	Do.	Birsa		Do. do.	Coal from Birsa.
804	7483	Do.	Borra		Do. do.	Coal from Borra, fourth seam.
7164	7697	20th Nov. 1894	Do.		Managing Agent, Borra Coal Company	Salepura coal
9163	2067	4th Oct. 1894	Sancitoria		Bengal Coal Company, Limited.	Coal from Sancitoria.
7851	7381	10th July 1894	Searole		Searole and Jemahiri Collieries, Searole, Rajbari.	Searole steam coal
9152	7320	Do.	Jemahiri		Do. do.	Jemahiri coal
9164	2088	4th Oct. 1894	Madhabpur		Bengal Coal Company, Limited.	Madhabpur coal

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Coal Supply of India.

COAL

APPENDIX
Standard
Series

Number of Coal	Caking Power 100	Caking Power 100	Caking Power 100	Caking Power 100	Caking Pro- portion	Colour of Ash.	Other Characteristics of the Coal.	
601	47.9	7.79	17.17	87.9	9.49	Does not cake	Dark yellow	Dull black, clean, and very hard,
602	47.9	8.79	17.19	87.9	9.49	Do.	Yellowish brown	Dull black, hard, clean, breaks into cubes,
603	47.9	14.75	17.14	87.9	9.49	Cakes	Dark	Dull, rather tough, breaks in every direction with little dust,
702	47.9	8.79	17.19	87.9	9.49	Do.	Buff	Clean, but rather dusty, crumbles readily, bright in layers,
604	47.9	8.79	17.19	87.9	9.49	Do.	Light yellow	Bright, dirty, fairly hard,
605	37.7	8.79	69.35	33.9	9.19	Do.	White	Mixed dull black and glossy, the latter crushes readily, clean,
606	17.9	14.75	37.16	47.9	9.39	Do.	Brownish yellow	Dull and glossy laminae, clean and hard,
607	47.9	17.79	17.19	87.9	11.59	Do.	White	A dull black coal, clean and hard,
608	17.9	10.79	69.35	33.9	9.19	Do.	Terra-cotta	Alternate dull and bright layers, breaks easily in small fragments, clean,
609	47.9	8.79	37.13	47.9	9.39	Cakes	Flesh colour	Alternate bright and dull layers, breaks easily in small fragments with little dust, clean,
704	37.7	8.79	69.35	37.18	9.39	Do.	Do.	Dull with many bright patches, clean,
610	37.7	17.79	69.35	37.18	9.39	Do.	Dirty pink	Dull, with bright patches, breaks easily in layers, clean,
601	37.7	14.75	72.17	27.83	9.79	Do.	Grey white	Dull, silty coal with glistening layers and patches, Hard and brittle, very clean,
612	47.9	11.79	69.79	39.39	11.62	Do.	Lemon yellow	A glossy coal, hard, but with soft patches,
613	44.79	8.79	52.13	46.99	9.39	Do.	Fawn	Alternate layers of dull and bright coal, clean, easily broken, cleaving in layers,
614	44.79	10.79	55.39	44.19	9.39	Do.	Terra-cotta	Alternate layers of dull and bright coal, hard, dusty when broken,
615	37.7	17.79	55.39	44.19	11.59	Do.	Brownish yellow	A dull coal, laminated, hard, with soft patches, clean,

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COAL.	Report on the					TABLE
	Sample No.	Date received	Date	Mine,	Where received.	
Bengal						
7105	6771	4th Oct. 1894	Santarpur	Bengal Coal Company, Limited.	Santarpur coal	
7106	678	De.	Santarpur	Do. do. do.	Coal from Santarpur.	
7143	7000	5th Mar. 1894	Dallongh	Dr. Saine, through Station Master, Gya.	Dallongh coal, Rajbari area.	
7148	7100	8th Mar. 1894	Jharia	Bengal-Nagpur Coal Company, Limited, through George Alexander, Esq.	Coal taken from Jharia.	
7149	7101	De.	De.	Do. do. do.	Coal taken from a quarry at Santarpur. These two samples are not only surface coal, but have been exposed to the atmosphere for some months.	
7151	7202	15th July 1894	Bermuda	Managing Agent, Damedia Coal Company.	Coal from Bermuda Colliery.	
7152	7318	De.	Lucknow	Do. do. do.	Coal from Lucknow Colliery.	
7153	7319	De.	Ghosick	Do. do. do.	Coal from Ghosick Colliery.	
7154	7316	De.	Bharsikha	Do. do. do.	Coal from Bharsikha or Damedia Colliery.	
8151	7768	25th Nov. 1894	Chattabed	Ketran-Jheria Coal Company, Limited, Kairna, Manikganj.	Chattabed, No. 12 seam.	
8152	7770	De.	Moulana	Do. do. do.	Moulana, East Colliery, No. 13 seam.	
8154	7769	De.	Do.	Do. do. do.	Moulana, South Colliery, No. 14 seam.	
8155	7771	De.	Do.	Do. do. do.	Moulana, West Colliery, No. 15 seam.	
8156	7772	De.	Chotnadeo	Do. do. do.	Chotnadeo, No. 13 seam.	

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Coal Supply of India.

COAL.

APPENDIX.

The Indian Coal Survey.

Number of Coal Field	Altitude in feet	Altitude in metres	Coal Type	Miner- able Volume in cubic yards	Miner- able Volume in cubic metres	Caking Pro- portion.	Colour of Ash.	Other Characteristics of the Coal.
600	4770	1447	6000	2770	1770	173	Causes . . .	Yellowish grey. A dull coal with bright patches, hard and clean.
600	4770	1447	5470	2770	1770	171	Do. . .	Fawn . . . A clean, bright coal, cleaving in layers.
600	4770	1447	5970	3270	2170	079	Does not cake. . .	Yellowish brown. Bright coal, rather hard, not very dirty, on some places a small amount of white deposit.
600	4770	1447	5070	2770	1770	079	Causes . . .	White . . . Bright glistening coal, brittle and hard, in places, has a patchy appearance.
600	4770	1447	5070	2770	1770	079	Do. . .	Light grey . . . Dull black coal with bright patches in places, cleaves occasionally with a silky fracture, rather hard, fairly clean.
600	4770	1447	5770	3470	2370	071	Do. . .	Cream . . . Clean, bright coal, easily broken, hard, but with soft patches.
600	4770	1447	6170	3670	2570	071	Do. . .	Fawn . . . In well-defined layers, part dull and part bright and glistening, clean, fairly tough, except that the bright layers crumble readily.
600	4770	1447	5570	3270	2170	079	Do. . .	Light fawn . . . Well-defined layers of dull and bright coal, the former tough, the latter rather brittle.
610	4770	1447	5770	3470	2370	078	Do. . .	Fawn . . . Bright coal, fractures readily. Made up of a dull and bright portion, Dull portion tough, whilst the bright is readily broken.
610	4770	1447	5770	3470	2370	078	Do. . .	Greyish red . . . A clean, rather bright coal, easily broken.
620	4770	1447	5770	3470	2370	078	Do. . .	Dirty white . . . Laminated bright coal, dirty, breaks very easily with much dust.
620	4770	1447	5770	3470	2370	078	Do. . .	Do. . . Dull coal with bright layers, clean.
620	4770	1447	5770	3470	2370	078	Do. . .	Reddish grey . . . Bright coal in layers, clean.
620	4770	1447	5770	3470	2370	078	Do. . .	Dirty white . . . Bright coal in layers, breaks easily, clean.

The Agricultural

COAL.

Report on the

TABLE

Specimen No.	Date	Specimen No.	Date	Where received.	Report made by Surveyor (Name).
BENGAL—contd.					
897	7762	25th Nov. 1892	Neeloti .	Adal Coal Company, Limited, Broad Colliery, Rangpur.	No. 1 sample .
898	7763	Do.	Do.	Do. do.	No. 2 sample .
899	7774	Do.	Kalipahari .	Brikettopur Coal Com- pany, Kalipahari.	Steam coal .
900	7766	Do.	Kastore .	Rasiganj Coal Associa- tion, Limited.	Coal from Kastore Colliery, Jharia.
901	7757	Do.	Patibehar .	South Barrakar Coal Company, Patibehar Colliery, No. 1 seam.	—
899	7761	Do.	Sibpur .	Katra-Jharia Coal Company, Limited, Churnapuri, Asansol, East India Railway, Sibpur Colliery.	Large lump .
8924	7763	Do.	Do.	Do. do.	Small pieces .
899	7767	Do.	Kastore .	Rasiganj Coal Associa- tion, Limited, & Fairlie Place, Calcutta.	Coal from Kastore Colliery, Jharia.
893	8110	25th Feb. 1892	Kelsoes .	Jharia Coal Company, Katra-Jharia Collieries, Machbaum.	Kelsoes, No. 12 seam .
BURMA.					
9363	8137	4th Oct. 1892.	Lethabkin .	Burma Coal Company, Limited.	Few feet of seam .
93638	8138	Do.	Do.	Do. do.	Few feet of seam .
CENTRAL INDIA.					
936	8068	Do.	Umoria .	Umoria Colliery .	—
932	8073	Do.	Do.	Do. .	—

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Coal Supply of India.

COAL

APPENDIX
Tabulated
Biosynthesis

Unnumbered

Calorific Value	Per cent Fixed Carbon	Ash	Vol. of CO	Methane	Hydrogen	Per cent Volatile Matter	Caking Properties	Colour of Ash.	Other Characteristics of the Coal.
5000	37.0	7.25	67.0	28.52	0.18	37.5	Does not cake.	Fawn	Alternate bright and dull layers, the dull coal being dirty to handle.
5000	37.0	10.75	67.0	28.52	0.17	37.5	Do.	Do.	Dull platy coal with many bright patches, rather tough, clean.
5000	37.0	37.0	37.0	37.0	0.14	37.0	Do.	Reddish grey	A bright coal with some duller layers.
5000	37.25	7.15	37.25	37.00	0.19	37.0	Cakes	Do.	Dull coal with bright layers, clean.
5000	37.25	10.75	37.25	37.00	0.19	37.0	Do.	Do.	Dull coal with bright layers, easily broken with much dust, dirty to handle.
5000	37.25	8.35	67.0	37.15	0.15	37.15	Does not cake.	Fawn	Alternate dull and bright layers, very dirty, breaks easily with much dust.
5000	37.25	8.35	67.0	37.15	0.15	37.15	Do.	Light fawn	Alternative dull and bright layers, breaks easily, clean.
5000	37.25	8.35	72.5	27.75	0.15	37.75	Cakes	Reddish white	Dull coal with graphitic lustre in oval pieces, and conchoidal fracture, breaks easily in layers with some dust, clean to handle.
5000	37.25	15.00	70.75	37.00	0.15	37.00	Do.	Dirty white	Rather bright coal with a silty lustre, breaks easily with some dust.
5000	37.25	8.35	47.0	47.0	0.33	37.0	Does not cake.	White	Dull black, clean and hard with rounded surface and fracture.
5000	37.25	8.35	†	37.0	0.11	37.0	Do.	Do.	Dull black, with glossy patches, very soft and soapy to touch, clean.
5000	37.25	8.35	87.25	37.00	0.33	37.00	Do.	Do.	A clean dull coal with irregular cleavage, easily broken.
5000	37.25	8.35	87.25	37.00	0.33	37.00	Do.	Greyish white	Dull, soft, clean, and contains fossilized resin.

† Does not burn readily.

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COAL.

UPPER
PROVINCE
COLLECTED
BY THE
AGRICULTURAL
DEPARTMENT

Report on the

TABLE

Sample No.	Date	Imported from	Date	No.	Whence received.	Remarks made in regarding sample.
CENTRAL INDIA—contd.						
7003	7001	15th Feb. 1894	Umaria .	The Manager, Umaria Colliery.		Sample from No. 3 seam, Middle area.
7004	7002	Do. .	Do. .	Do. .	Do. .	Sample from No. 3 seam, Middle area.
7005	7003	Do. .	Do. .	Do. .	Do. .	Sample from No. 3 seam, Northern area.
7006	7004	Do. .	Do. .	Do. .	Do. .	Sample from No. 3 seam, Northern area.
7007	7005	2nd July 1894	Do. .	Do. .	Do. .	Sample from No. 3 seam, Northern area.
7008	7006	Do. .	Do. .	Do. .	Do. .	Sample from No. 3 seam, Middle area. "Information required as to their coking properties."
CENTRAL PROVINCES.						
9160	9161	4th Oct. 1894	Mohapsi .	The Norberda Coal and Iron Company, Limited, Mohapsi, Coal Mine.		From No. 1 seam .
8284	7775	Do. .	Do. .	Do. .	Do. .	Sample A . . .
8285	7776	Do. .	Do. .	Do. .	Do. .	Sample B . . .
8286	7777	Do. .	Do. .	Do. .	Do. .	Sample C . . .
9310	1665	..	Warora .	Warora Colliery .		—
9310	1667	..	Do. .	Do. .	Do. .	—
8130	7779	1st Sept. 1894	Do. .	Manager, Colliery.	Warora	From No. 3 pit .
8131	7780	Do. .	Do. .	Do. .	Do. .	From No. 4 pit .
8132	7781	Do. .	Do. .	Do. .	Do. .	From No. 5 pit .

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Coal Supply of India.

COAL

APPENDIX

Translated
Bengali

II.-part

Number of Coal	Length in feet	Width in feet	Amt in cwt	Depth in feet	Volume in cwt	Weight in tons	Per ton	Caking Properties	Colour of Ash.	Other Characteristics of the Coal.
100	12'0	12'0	27'00	27'00	27'00	0'75	0'75	Does not cake.	White	Small quantities of white substance between the layers to place. Rather dirty to handle. Similar to 100.
101	21'0	12'0	27'00	27'00	27'00	1'00	1'00	Do.	Do.	Do.
102	12'0	12'0	60'00	27'00	27'00	1'00	1'00	Do.	Do.	Similar to 100. Traces of iron pyrites in cleavage, rather tough.
103	12'0	12'0	65'00	24'00	24'00	1'00	1'00	Do.	Do.	Similar to 100, and 102, but not so dirty to handle. It also shows a silty patches appearance when cleaved.
104	12'0	12'0	45'00	33'00	33'00	1'00	1'00	Do.	Reddish white.	Tough coal of dull appearance, cleaving in layers.
105	12'0	12'0	27'00	27'00	27'00	1'00	1'00	Do.	Dirty white	Dull, with small bright patches. Irregular cleavage, easily broken, with much dust, dirty.
106	12'0	24'0	60'00	23'00	23'00	0'90	0'90	Do.	Brownish yellow.	Dull, laminated, very hard, fairly clean.
107	12'0	12'0	27'00	47'00	47'00	0'50	0'50	Do.	Light brown	A shaly coal, dull, with bright spots in layers, breaks easily, dirty, gives much dust.
108	12'0	12'0	60'00	31'00	31'00	0'67	0'67	Do.	Do.	A dull coal, very light, breaks easily, much dust, very fibrous.
109	12'0	11'00	62'00	62'00	27'00	1'00	1'00	Do.	Terra-cotta	A dull coal with some bright layers, breaks easily with much dust, very dirty.
110	12'0	12'0	54'00	54'00	45'00	0'90	0'90	Do.	White	Dull, with bright patches, clean and rather soft.
111	12'0	12'0	33'75	33'75	40'25	1'00	1'00	Do.	Do.	A clean silty coal, easily broken, cleaving in cubes.
112	12'0	12'0	24'00	24'00	40'10	0'90	0'90	Do.	Greyish white.	Very dull coal with some brighter patches, rather dirty.
113	12'0	12'0	50'00	41'00	41'00	1'00	1'00	Do.	Do.	Same as 110.
114	12'0	12'0	57'35	42'00	42'00	0'77	0'77	Do.	Dirty white	Do.

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COAL.		Report on the				Remarks made in interviewing source.
Specimen No.	Date	Mine	Where received.			
TABLE						
9122	7773	1st Sept. 1896.	Wazir.	Manager, Colliery	Wazir	From No. 1 mine, No. 1 pit.
9145	7853	4th Oct. 1896.	Mohpat.	Gadswara	do.	No. 2 mine . . .
9146	7854	Do.	Do.	Do.	do.	No. 3 mine . . .
9147	7855	Do.	Do.	Do.	do.	No. 4 mine . . .
CENTRAL PROVINCES.—contd.						
9148	7856	... .	Singareni	Hyderabad	do.	—
9149	7268	... .	Do.	Agent and General Manager, Hyderabad (Deccan) Company.	do.	Singareni coal . . .
NIZAM'S DOMINIONS.						
9150	7857	3rd Feb. 1896.	Dandot.	Mining Manager, Col- liery District, North- Western Railway.	do.	Two boxes of Dandot steam coal.
9151	7858	Do.	Pith.	do.	do.	Two boxes of Pith steam coal. These are very frangible and deteriorate rapidly if exposed to the air, and when in bulk are apt to suffer spontaneous combus- tion.
9152	7859	Do.	Pith.	do.	do.	do.
9153	7860	Do.	Pith.	do.	do.	do.
9154	7212 and 7213 and 7214	33rd Feb. 1896.	Boghaswala.	Do.	do.	Two boxes of Boghaswala coal.
9155	7055	13th Feb. 1896.	Pith.	*	Do.	Pith shale. It is believed to contain mineral oil, and is known to contain gas. Further information de- sired on these points.
9156	7056	13th Feb.	Dandot.	do.	do.	Dandot shale, the same information desired as above (Pith shale).
9157	7319	20th April 1896.	Shahrig.	Executive Shahrig, District North-Western Rail- way.	Engineer, District North-Western Rail- way.	Takrai top seam and from Malavay, West.

C. 14144 R.

Lodger.

COAL.

APPENDIX.
Tabulated
Results.

Coal Supply of India.									
Number	Name	Latitude	Longitude	Elevation	Altitude	Caking	Properties	Colour of Ash.	Other Characteristics of the Coal.
100	100	10° 10'	87° 10'	6770	57' 20"	9' 10"	Does not cake.	Slightly yellow	Silky dull coal with only a few bright spots, dirty, rather tough.
101	101	10° 10'	87° 10'	6770	57' 20"	9' 20"	Cakes . . .	White . . .	Dirty, alternate layers of dull and very hard coal and bright coal, easily broken.
102	102	10° 10'	87° 10'	6770	57' 20"	9' 40"	Do. . . .	Yellowish brown. . . .	Dull, hard and clean with occasional glossy layers.
103	103	10° 10'	87° 10'	54' 50"	45' 40"	9' 40"	Do. . . .	Light yellow	
104	104	10° 10'	87° 10'	57' 20"	47' 70"	9' 10"	Does not cake.	Yellowish brown.	Irregular fracture, extremely hard, dull, clean coal, with thin streaks of glossy coal.
105	105	10° 10'	87° 10'	57' 20"	47' 70"	9' 10"	Cakes slightly.	Dark fawn . . .	Very tough, dull, with bright patches.
106	106	10° 10'	87° 10'	57' 20"	49' 50"	9' 30"	Does not cake.	Reddish white . . .	Dull, with bright patches, easily broken, clean.
107	107	10° 10'	87° 10'	59' 50"	50' 50"	9' 30"	Do. . . .	Flesh colour	Clear, rather bright, easily broken, with little dust.
108	108	10° 10'	87° 10'	67' 10"	57' 00"	9' 30"	Cakes slightly.	Dirty yellow . . .	Dull, breaks readily with irregular fracture, white substance, brown resin.
109	109	10° 10'	87° 10'	67' 10"	57' 20"	9' 30"	Do. . . .	Flesh colour . . .	Similar to 108.
110	110	10° 10'	87° 10'	59' 50"	49' 70"	9' 40"	Does not cake.	Dirty white . . .	This shale is in layers. A resinous substance is found occasionally between the layers. Mineral oil by distillation, small. Yield of gas low, illuminating power deficient.
111	111	10° 10'	87° 10'	59' 50"	49' 70"	9' 40"	Do. . . .	Light fawn	Dull, grey black coal with sooty touch. Contains a small quantity of brown resinous matter. Mineral oil, very small, yield of gas very low, illuminating power small.
112	112	10° 10'	87° 10'	59' 50"	49' 70"	9' 40"	Cakes	Creamy brown	Easily broken, a quantity of a resinous substance between the layers.

C. I4I4-41.

COAL.**APPENDIX.****Ultimate Analyses.**

Indian Provinces Name No. and Min.	Report on the						
	Results of Ultimate Analyses of Selected Indian Coals.						
	Provinces and Mine.	Carbon	Hydro- gen	Ash	Mine- Coke	Sul- phur	Rope Char- coal
ASIA—							
120	Mahan	77.31	5.43	1.97	3.99	0.02	1.70
121	Cherrapunj	77.75	5.93	4.74	3.63	0.02	1.72
97	Mashong	75.95	5.17	3.93	3.15	0.02	1.73
BALUCHISTAN—							
93	Khost	71.36	4.99	5.37	2.95	0.16	1.51
94	De	70.58	5.05	7.04	3.46	0.24	1.69
BENGAL—							
90	Kamardibhi	70.43	4.70	13.85	1.90	0.33	1.11
KARKHOHARI—							
630	Lower Sonar	80.75	4.32	7.37	1.23	0.02	1.51
641	Upper "	82.53	4.90	5.25	1.30	0.02	1.51
1020	Sukdipur	79.79	4.97	5.93	2.54	0.02	1.51
1030	Lishoor	74.33	4.60	9.99	2.03	0.33	1.70
MYANMAR—							
2531	Lethabon	69.15	4.94	9.38	1.53	0.33	1.70
CENTRAL PROVINCES—							
1020	Mohganj	67.45	4.37	9.73	2.07	0.43	1.71

TABLE III.

*Previous Analyses of Indian Coal.***Previous
Analyses.**

Province and Mine.	Caloric Value	Fixed Carbon	Ash	Coke	Molten Matter	Sulphur	Reference
ASIA—	—	—	—	—	—	—	J. Prinsep.
Cherrapunj	—	—	—	—	—	—	
Lengta Coal-field, Khasia Hills—	—	—	—	—	—	—	
Sons No. 1	—	50.40	8.66	39.90	41.0	—	T. D. La Tache, Coal Survey, Vol. 1, Pt. 2, 1884.
" No. 2	—	50.80	6.00	51.4	47.6	—	

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Coal Supply of India.

TABLE III.—contd.

Product and Mine.	Calorific Value, Heat Units.	Fusible Carbon.	Ash.	Coke.	Volatile Matter.	Slagger.	Reference.	COAL.
Dhanbad.								
Khasia Hills—								
No. 1	—	47	77	55	44	—		
" 2	—	51	55	54	45	—		
" 3	—	49	71	73	34	—		
" 4	—	46	51	49	34	—		
" 5	—	57	89	57	43	—		
Maslong, Khasia Hills—								
No. 1, Deden Hill . . .	—	57	31	60	30	—		
" 1, Maslong . . .	—	55	15	57	43	—		
Makum	—	53	10	58	46	—		
Makum (average)	—	75	11	68	37	—		
Average of 17 analyses of Assam coal	—	60	38	63	36	—		
Chittagong, A.	—	58	38	61	38	—		
" B.	—	55	38	64	35	—		
Assam coal	—	53	33	59	55	44	—	
Burmanistan—								
Khot Colliery	—	48	6	50	50	—		
Bengal—								
Raniganj (average of 30) . .	—	53	10.11	70.07	36.03	—		
" (North Bengal Coal Company Upper Basin). . .	—	74.31	10.43	84.74	14.79	0.43		
" Alipore (average) . . .	—	59.89	60.80	10.02	75.49	30.81	—	T. H. Ward.
" (Barakar)	—	64.26	7.37	71.53	27.93	0.50		
" (Dhaka)	—	69.81	7.04	57.85	47.75	—		
" (Borsa)	—	57.38	60.70	10.03	70.73	30.37		
" (Belool)	—	57.40	57.70	9.99	63.39	35.75		
" (Average of 16) . . .	—	51.08	10.37	67.35	33.65	—		
" (good specimen) . . .	—	51.80	10.70	65.50	37.90	—		
								Mem. Geol. Survey.
								APPENDIX.
								Previous Analyses.

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The Agricultural

COAL.

APPENDIX.
**Previous
Analyses.**

Report on the

TABLE III.—contd.

Province and Mine.	Crude Oleic Vit.	Final Oleic Vit.	As. %	C. O. %	Volatile Matter, %	Sol. %	Residue, %	Remarks
BENGAL—contd.								
Karbaria, Lower sonam .	7233 69'82	67'15	75'98	62'90	67'60	67'42	—	
" " "	7182 67'53	71'49	79'22	59'24	67'90	67'70	—	
" " "	7238 64'97	67'15	74'80	57'90	67'80	67'64	—	
" Upper sonam .	6944 69'46	71'96	77'42	57'80	67'50	67'50	—	
" Bhadoha sonam .	6888 68'92	72'50	74'63	57'37	67'80	67'80	—	
" " "	6811 67'48	70'60	77'22	57'40	67'90	67'70	—	
" Khudia sonam .	6911 67'10	67'30	67'42	57'90	67'90	67'90	—	
" average . .	7082 67'60	72'32	72'90	57'91	67'60	67'60	—	
" (Ghosh Coal, Bengal Coal Company). . .	6975 69'30	74'10	74'40	57'94	67'90	67'90	—	Geol. Dept., 1891.
Kanayara (Damoda) . .	... 64'8	8'3	72'0	57'0	67'0	67'0	—	
Auranga (Dawda) . .	... 56'3	57'5	64'0	56'0	67'0	67'0	—	Balf's Geology.
Daltongan (Koti Valley). .	... 64'8	10'7	75'8	21'05	7'43	7'43	—	
" No. 1 . .	... 49'44	48'32	58'96	21'76	—	—	—	
" " 1A . .	... 58'78	31'32	70'10	59'00	—	—	—	
" " 2 . .	... 50'34	58'70	53'18	16'98	—	—	—	T. De la Torre, Ord. Survey, Report, and Hand-book.
" " 4 . .	... 44'90	11'30	61'60	58'40	—	—	—	
" " 9 . .	... 50'44	11'10	60'36	33'06	—	—	—	
" (Palaman Colt. Field, average). . .	... 50'40	11'70	68'22	31'77	—	—	—	Sales, Hand-book.
Hetao (Koti Valley) . .	... 53'36	10'7	69'05	33'95	—	—	—	Balf's Geology.
Dacjelling (average of 8) . .	... 50'90	17'41	70'90	27'94	—	—	—	P. N. Bow, Hand-book.
Tindaria (not worked) . .	... 65'22	27'08	62'90	7'90	—	—	—	T. H. Ward, Hand-book.
Antargoa sonam, Banbar rocks. Kalgona sonam, Banbar rocks. 51'30	30'40	71'72	58'70	—	—	—	Balf's Geology.
BURMA—								
Murray Coal Company .	13'00	9'70	13'30	8'30	39'44	—	—	T. H. Ward, Hand-book.

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Coal Supply of India.

COAL.

TABLE III.—contd.

APPENDIX.

Previous
Analyses.

Portion and Mine, •	Caloric Value,	Fined Carbon,	Ash,	Coke	Volatile Matter,	Sulphur,	References.
North-western.							
Sonth (Sonth Coal Company), seven analyses—							
Lathmar . . .	48'98	47'98	1'98	46'48	30'32	—	
Ketwaria, No. 1 .	53'58	47'78	2'48	50'18	47'88	—	
“ “ 2 .	52'98	47'98	2'98	49'68	37'38	—	
Lathmar, No. 1 .	50'28	47'78	1'48	47'58	47'68	—	
“ “ 3 .	47'38	47'48	2'38	45'48	47'48	—	
Chandoli . . .	47'18	46'98	2'38	45'98	47'08	—	
Kulmang . . .	50'98	47'98	2'18	47'98	47'48	—	
Lathmar seam, top coal .	—	48'68	2'18	47'78	47'38	—	
“ “ bottom coal .	—	38'88	14'98	33'78	40'78	—	
Ketwaria outcrop, top coal .	—	44'28	7'48	31'08	47'38	—	
Ketwaria outcrop, bottom coal .	—	36'68	14'28	30'88	47'18	—	
Kulmang . . .	—	50'88	23'98	46'78	30'38	—	
Lonsda . . .	—	30'18	22'58	28'68	41'48	—	
Upper Chanderia (average of 11).—	—	49'98	5'28	35'78	44'72	—	
Mogni, Great Tana- sim River, { A .	—	30'88	13'88	54'78	45'38	—	
{ B .	—	47'58	19'38	61'88	38'18	—	
{ C .	—	47'98	8'98	33'88	47'78	—	
Bir Creek Coal, Chanderia Valley.	—	39'98	3'18	61'48	37'98	—	
Lathmar . . .	—	55'78	2'48	50'18	40'88	—	
Central India—							
Umaria (1865) . . .	—	71'78	10'08	87'68	17'38	Traces	Hand-book.
“ “ . . .	—	66'98	8'18	74'68	46'18	—	T. H. Ward.
Central Provinces—							
Nobpura . . .	—	64 to 70	10 to 12	74 to 85	18 to 22	1'00	
Wazir, large coal . . .	—	45'0	12'4	60'0	40'8	—	
“ black coal . . .	—	38'8	24'0	50'8	49'4	—	

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COAL.	Report on the Coal Supply of India.								
	TABLE III.—concl.								
Province and Mine.	Calorific Value.	Fixed Carbon.	Ash.	Coke.	Volatile Matter.	Sulphur.	References.		
CENTRAL PROVINCES—contd.									
Wazir	—	47·4	14·2	37·5	47·4	—	Ball's Geology.		
Ghaghra (average of 16)	—	47·9	16·0	46·32	37·48	—	Hand-book.		
Wazir (average)	—	47·8	16·0	41·24	47·16	4·24	Ball's Geology.		
Digmat	—	47·1	15·7	39·8	47·2	—	Hand-book.		
Johilla (1882), not worked	—	47·95	12·55	31·75	47·95	—	Hand-book.		
NIZAM'S DOMINION—									
Singareni, A.	—	47·4	15·00	27·4	47·0	—	Hand-book.		
“ B.	—	46·0	11·00	27·0	45·0	—	Hand-book.		
“ C.	—	50·0	13·00	46·0	32·0	—	Hand-book.		
“ D.	—	50·0	10·14	...	25·10	1·20	Hand-book.		
PUNJAB—									
Quetta coal (North-West Frontier).	—	51·80	4·60	35·90	47·00	—	Hand-book.		

Typical British Coals.

Province and Mine.	Calorific Value.	Fixed Carbon.	Ash.	Coke.	Volatile Matter.	Sulphur.	References.	
							Avg. cal. val.	Avg. cal. val.
Welsh coal	—	32·00	3·00	26·34	13·80	1·30	Official report on coal for navy.	
Newcastle	—	65·10	3·40	66·74	33·30	1·07	India's Hand-book.	
Bristol Lower Series (Steam).	—	49·35	6·16	75·51	34·00	1·30	Salter, Ball's Geology.	
Bristol Upper Series (Gas).	—	49·05	5·60	66·27	33·73	1·30	Salter, Ball's Geology.	

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O. I. C. P. O.—Re. 223-B. & A.—12-19-98.—2225.—G. R.

All communications regarding THE AGRICULTURAL LEDGER should be addressed to the Editor, Dr. George Watt, Reporter on Economic Products to the Government of India, Calcutta.

The objects of this publication (as already stated) are to gradually develop and perfect our knowledge of Indian Agricultural and Economic questions. Contributions or corrections and additions will therefore be most welcome.

In order to preserve a necessary relation to the various Departments of Government, contributions will be classified and numbered under certain series. Thus, for example, papers on Veterinary subjects will be registered under the Veterinary Series; those on Forestry in the Forest Series. Papers of more direct Agricultural or Industrial interest will be grouped according as the products dealt with belong to the Vegetable or Animal Kingdom. In a like manner, contributions on Mineral and Metallic subjects will be registered under the Mineral Series.

This sheet and the title-page may be removed when the subject-matter is filed in its proper place, according to the letter and number shown at the bottom of each page.

NOTICE.

Future issues of this publication placed under either the "Special Vetoary" or "Special Forest Series" will not be included in the annual enumeration. Such papers are printed for Departmental purposes. Their unfortunate inclusion in the system of annual numbering has led recipients of the ordinary issues to think their sets incomplete.

The following pamphlets have already appeared as Special issues, and have accordingly been furnished to the public :—

1894	.	Nos. 8, 9, 10, 11, 13 and 15.
1896	.	No. 8.

